CLAIMS

What is claimed is:

1   1.   A method for analyzing particle systems of surface facets using polarized scattered light,

2   said method comprising the steps of:

3   providing models of multiple particle systems, the particle systems comprising surface

4   facets;

5   performing ray-trace analysis with respect to the models over a range of scatter angles,

6   the ray-trace analysis involving only use of second-order rays;

7   receiving information corresponding to a particle system of interest; and

8   predicting at least one characteristic of the particle system of interest using information

9   generated during the ray-trace analysis.

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1   2.   The method of claim 1, wherein, in performing ray-trace analysis, Fresnel reflections are

2   used.

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1   3.   The method of claim 1, wherein, in performing ray-trace analysis, constructive

2   interference of the second-order rays is considered.

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1   4.   The method of claim 1, wherein, in performing ray-trace analysis, information

2   corresponding to polarization state at near-back-scatter angles is generated for each of the

3   models.

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1   5.   The method of claim 1, wherein providing models of multiple particle systems comprises

2   the step of:

3   providing a model for each of multiple values of a separation parameter (l) for a selected

4   particle size.

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1   6.   The method of claim 1, wherein predicting at least one characteristic of the particle

2   system of interest comprises the step of:

3   comparing the information corresponding to the particle system of interest to the

4   information generated to determine which model most closely corresponds to the particle system

5   of interest.

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1   7.   The method of claim 1, wherein, in comparing the information corresponding to the

2   particle system of interest to the information generated, the minimum values of polarization state

3   versus back-scatter angles are compared.

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1   8.   The method of claim 1, wherein:

2   the method additionally comprises the step of:

3   detecting values of the intensities I_{TM} and I_{TE} at various back-scatter angles with

4   respect to the

5   particle system of interest; and

6   the information received corresponds to the values of I_{TM} and I_{TE} detected.

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1   9.   A method for analyzing particle systems of surface facets using polarized scattered light,

2   said method comprising the steps of:

3   calculating relationships between polarization states and back-scatter angles with respect

4   to multiple arbitrary particle systems, at least some of the particle systems comprising surface

5   facets;

6   receiving information corresponding to a particle system of interest;

7   correlating the information received with the relationships calculated to determine a best

8   fit based, at least in part, on a minimum value of the polarization state of the particle system of

9   interest; and

10   using the best fit to estimate at least one characteristic of the particle system of interest.

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1   10.   The method of claim 9,wherein, in calculating relationships, Fresnel reflections are used.

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1   11.   The method of claim 10, in calculation relationships, second-order ray-trace analysis is

2   performed with respect to at least some of the particle systems that comprise surface facets.

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1   12.   A computer-readable medium having a computer program stored thereon, the computer

2   program being executable to perform computer-implemented method steps, said method steps

3   comprising:

4   receiving information corresponding to a model of a particle system that comprises

5   surface facets;

6   generating information corresponding to polarization state and back-scatter angle of the

7   model at multiple separation parameters (l) using second-order ray-trace analysis;

8   receiving information corresponding to a particle system of interest; and

9   predicting at least one characteristic of the particle system of interest using the

10   information generated.

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1   13.   The computer-readable medium of claim 12, wherein the method step of generating

2   information comprises the step of using constructive interference of second-order rays.

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1   14.   The computer-readable medium of claim 12, wherein the method step of predicting at

2   least one characteristic of the particle system of interest comprises the steps of:

3   comparing the information corresponding to the particle system of interest to the

4   information generated; and

5   determining which separation parameter most closely corresponds to the particle system

6   of interest based on the comparing step.

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1 15. The computer-readable medium of claim 14, wherein the method step of comparing the

2 information corresponding to the particle system of interest to the information accessed, the

3 minimum values of polarization state versus back-scatter angles are compared.

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1 16. A computer-readable medium having a computer program stored thereon, the computer

2 program being executable to perform computer-implemented method steps, said method steps

3 comprising:

4   calculating relationships between polarization states and back-scatter angles with respect

5 to multiple arbitrary particle systems, at least some of the particle systems comprising surface

6 facets;

7   receiving information corresponding to a particle system of interest;

8   correlating the information received with the relationships calculated to determine a best

9 fit based, at least in part, on a minimum value of the polarization state of the particle system of

10 interest; and

11   using the best fit to estimate at least one characteristic of the particle system of interest.

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1 17. The computer-readable medium of claim 16, wherein, in calculating relationships,

2 Fresnel reflections are used.

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1 18. The computer-readable medium of claim 16, wherein, in calculating relationships,

2 second-order ray-trace analysis is performed with respect to at least some of the particle systems

3 that comprise surface facets.

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1   19.   A system for analyzing a particle system using polarized scattered light comprises:

2   a model of multiple particle systems comprising surface facets, the model being

3   configured to provide information corresponding to polarization state and back-scatter angle of

4   the multiple particle systems at multiple separation parameters (l) using second-order ray-trace

5   analysis; and

6   a computer operative to access the model, the computer being further operative to:

7   receive information corresponding to a particle system of interest; and

8   predict at least one characteristic of the particle system of interest using the

9   information provided by the model.

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1   20.   The system of claim 19, further comprising:

2   means for storing the model such that the model is accessible by the computer.